IN THE CLAIMS

1. (Currently Amended) A heat pump cycle comprising:

a compressor for compressing a refrigerant;

a heat exchanger downstream of said compressor;

a main expansion device downstream of said heat exchanger;

an evaporator downstream of said main expansion device, and a refrigerant flowing from said compressor to said heat exchanger, to said expansion device, to said evaporator, and returning to said compressor; ~~and~~

a control for said cycle, said control being operable to control components and initiate a defrost mode at which refrigerant from a discharge side of said compressor is cycled into said evaporator at a relatively hot temperature to defrost said evaporator, said control being operable to initiate said defrost mode based upon an algorithm developed to maximize heat transfer from said heat pump to an environment to be heated;

said environment to be heated is a hot water supply, and a water pump drives cooler water through said heat exchanger to be heated by said refrigerant, with said water pump being stopped during defrost mode;

said control operating to minimize the likelihood of water being heated unduly by hot refrigerant in said heat exchanger during defrost mode, said water pump being actuated intermittently to minimize said likelihood; and

said water pump being stopped during defrost mode, but said water pump does not stop until said control has determined that a discharge temperature of said refrigerant has dropped below a predetermined maximum to minimize said likelihood.

2.-5. (Cancelled)

6. (Currently Amended) The cycle as set forth in claim 1, ~~claim 5,~~ wherein an actual discharge temperature is compared to said predetermined maximum, and if said actual discharge temperature exceeds the predetermined maximum, a new target refrigerant pressure is

determined, and said control controlling said expansion device to achieve said new target pressure.

7. (Original) The cycle as set forth in claim 1, wherein a fan drives air over said evaporator, said fan being stopped during said defrost mode.

8. (Original) The cycle as set forth in claim 7, wherein said fan is actuated at least when said control determines said defrost mode is nearing an end point.

9. (Original) The cycle as set forth in claim 1, wherein said control determines said control algorithm experimentally to increase average heat transfer.

10. (Original) The cycle as set forth in claim 9, wherein a system condition developed for said experimental relationship is the difference between outdoor temperature and a temperature downstream of said evaporator.

11. (Original) The cycle as set forth in claim 1, wherein initiation of said defrost mode is based upon at least one system condition chosen from the group of refrigerant temperature, refrigerant pressure and outdoor temperature.

12. (Original) The cycle as set forth in claim 1, wherein said defrost mode includes opening a bypass to bypass a portion of a refrigerant downstream of said compressor around said heat exchanger.

13.-17. (Cancelled)

18. (Currently Amended) A heat pump cycle comprising:

a compressor for compressing a refrigerant;

a heat exchanger downstream of said compressor;

a main expansion device downstream of said heat exchanger;

an evaporator downstream of said main expansion device, and a refrigerant flowing from said compressor to said heat exchanger, to said expansion device, to said evaporator, and returning to said compressor;

a fan for blowing air over said evaporator;

a hot water supply to be heated in said heat exchanger and a water pump for moving water through said heat exchanger; ~~and~~

a control for said cycle, said control being operable to control components and initiate a defrost mode at which refrigerant from a discharge side of said compressor is cycled into said evaporator at a relatively hot temperature to defrost said evaporator, said control being operable to initiate said defrost mode based upon an algorithm developed to maximize heat transfer from said heat pump to an environment to be heated, said control also being operable to stop said water pump during defrost mode and operates to minimize the likelihood of water in said heat exchanger being unduly heated during defrost mode, said control also stopping said fan during defrost mode, and monitoring system conditions to identify an approaching end of said defrost mode, and actuating said fan to begin blowing air over said evaporator prior to an end of said defrost mode; and

said water pump being stopped during defrost mode, but said water pump does not stop until said control has determined that a discharge temperature of said refrigerant has dropped below a predetermined maximum to minimize said likelihood.

19. (Original) The cycle as set forth in claim 18, wherein said water pump is actuated intermittently to minimize said likelihood.

20. (Cancelled)

21. (Original) The cycle as set forth in claim 18, wherein said defrost mode includes opening a bypass to bypass a portion of a refrigerant downstream of said compressor around said heat exchanger.

22. (Previously Presented) The cycle as set forth in claim 1, wherein said algorithm includes defining an optimum point to initiate defrost mode based upon a temperature difference between outdoor air, and a refrigerant temperature.

23. (Previously Presented) The cycle as set forth in claim 1, wherein the algorithm includes utilizing a refrigerant pressure to determine a point for beginning the defrost cycle.

24. (Previously Presented) The cycle as set forth in claim 18, wherein said algorithm includes defining an optimum point to initiate defrost mode based upon a temperature difference between outdoor air, and a refrigerant temperature.

25. (Previously Presented) The cycle as set forth in claim 18, wherein the algorithm includes utilizing a refrigerant pressure to determine a point for beginning the defrost cycle.